BOPF Queries

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Agenda

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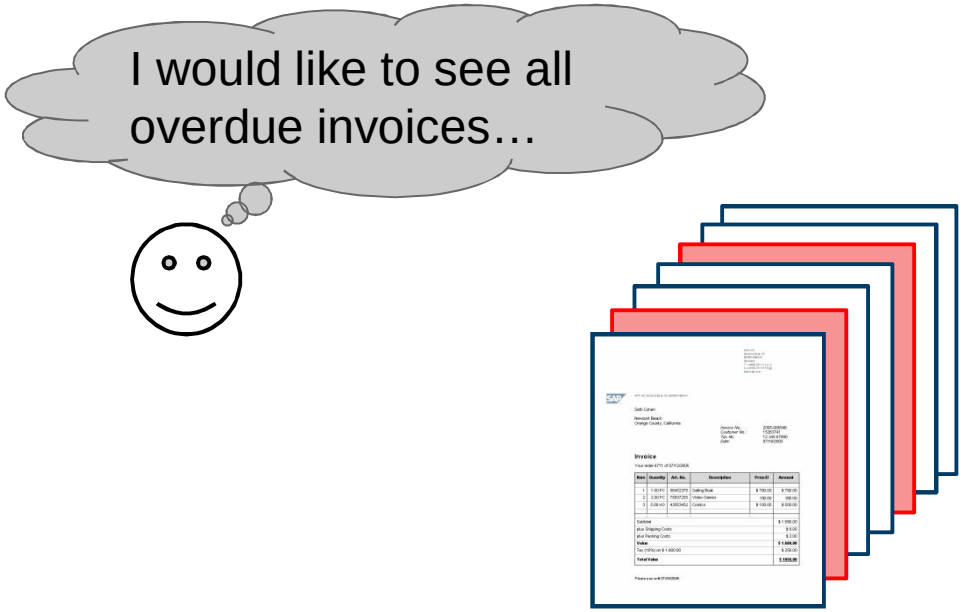
Creating a Query

Implementing a Custom Query

Introduction

Introduction

Motivation



The application for editing customer invoices must offer a screen for displaying all overdue invoices. This is implemented using of a query located in the `CUSTOMER_INVOICE` business object that returns the invoices in question .

Introduction
Definition

A query is a business object entity and is always assigned to a certain node, whose instances are returned.

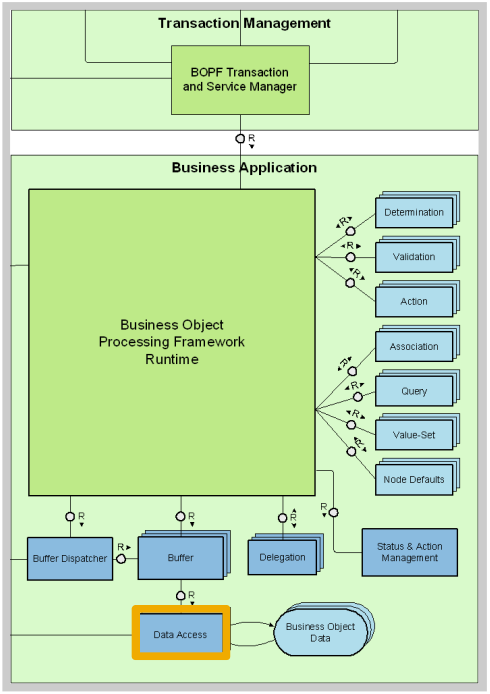
The consumer is able to query either only the keys or the whole data of the resulting node instances.

Queries never modify any node instance data.

There are three types of queries:

- Node attribute query
- Custom query
- Generic result query

Query Types
Node Attribute Queries



Resolved by BOPF DAC without any implementation work.

There are two in-built node attribute queries available:

SELECT_ALL:

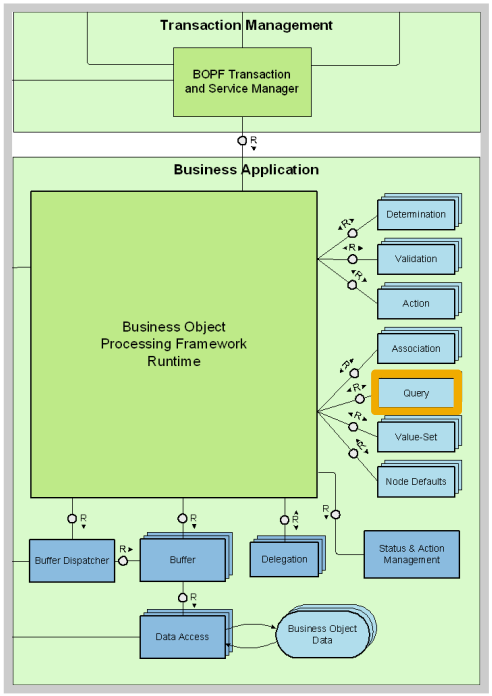
- No query parameter structure
- Returns all node instances of the assigned node of the query

SELECT_BY_ELEMENTS:

- Query parameter structure corresponds to a range table related to the assigned nodes' attributes
- Returns only node instances of the assigned node whose attributes comply with this range table

Query Types

Custom Query and Generic Result Query



Custom Query

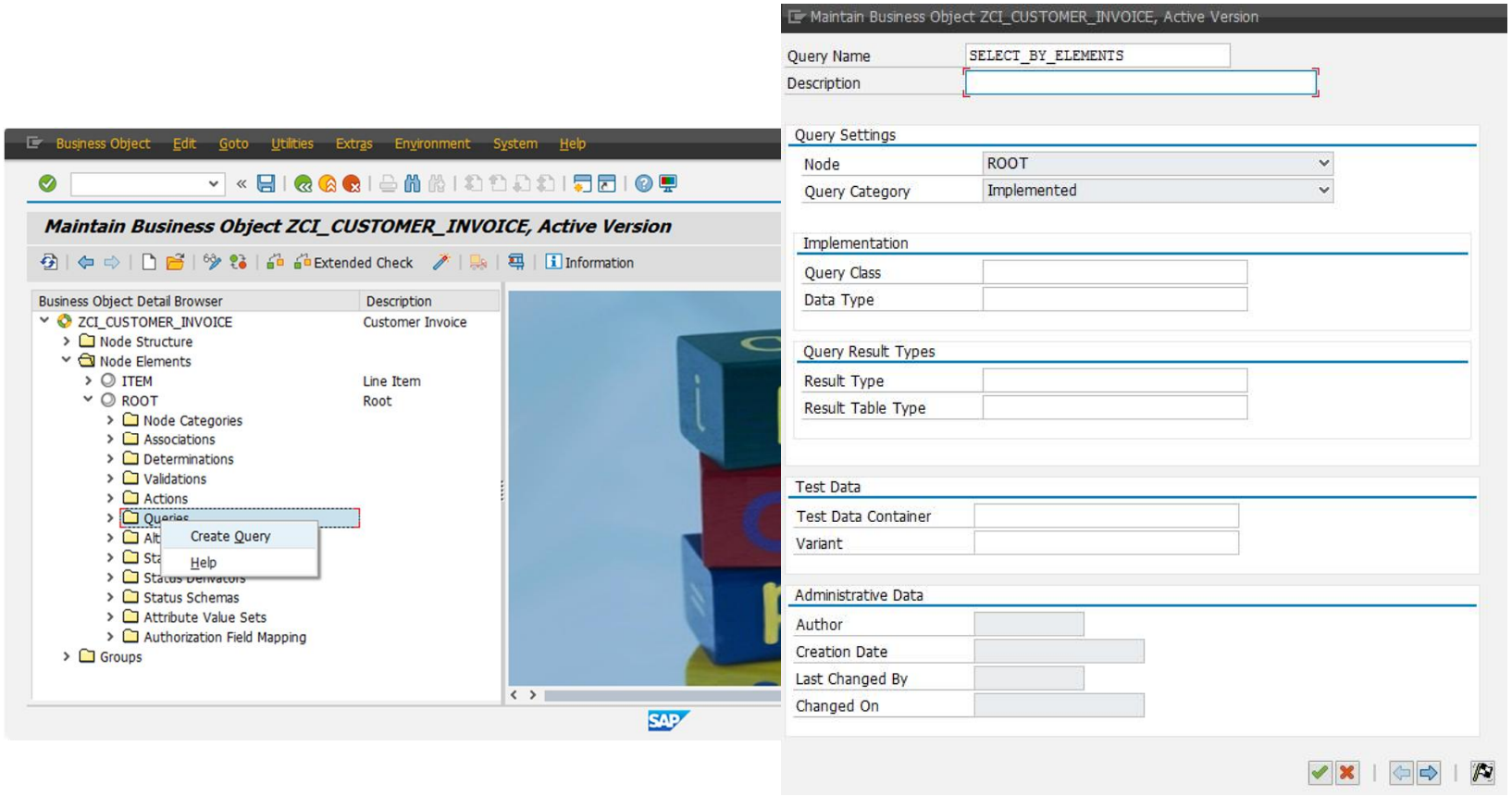
- Needed to provide application-specific queries whose logic is not covered by node attribute queries
- Resolved using an implementing class
- Query parameter structure is arbitrary
- Returns only node instances of the assigned node of the query
- **Example**: `GET_OVERDUE_INVOICES`

Generic Result Query (special kind of custom query)

- Needed in rare use cases that cannot be realized with custom queries due to performance reasons (e.g. de-normalized read-only lists for the UI)
- May return any kind of data table (but these must contain a KEY component relating to the instances of the assigned node)

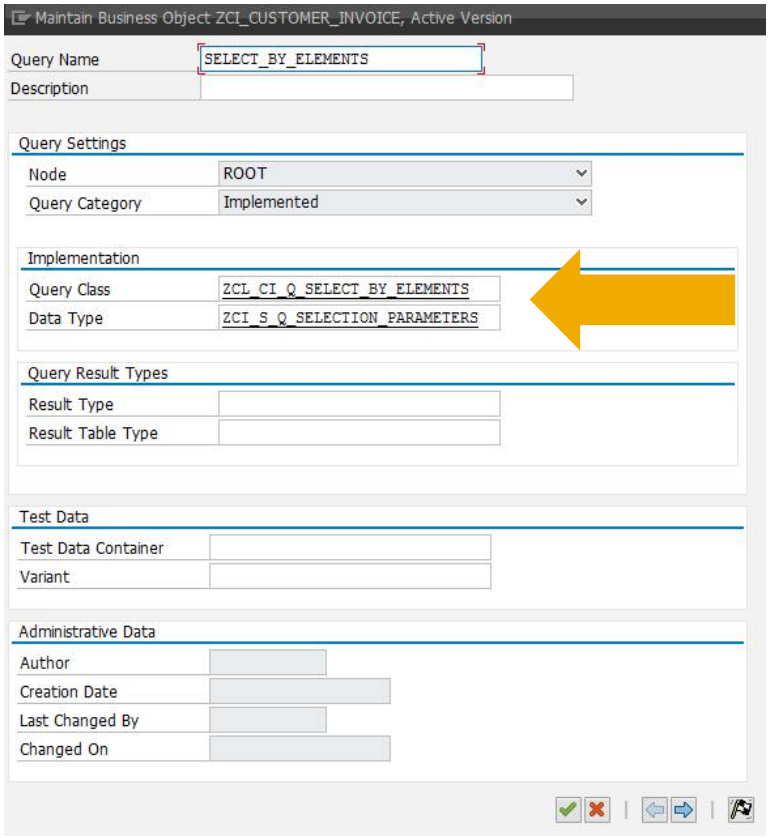
Creating a Query

Creating a Node Attribute Query



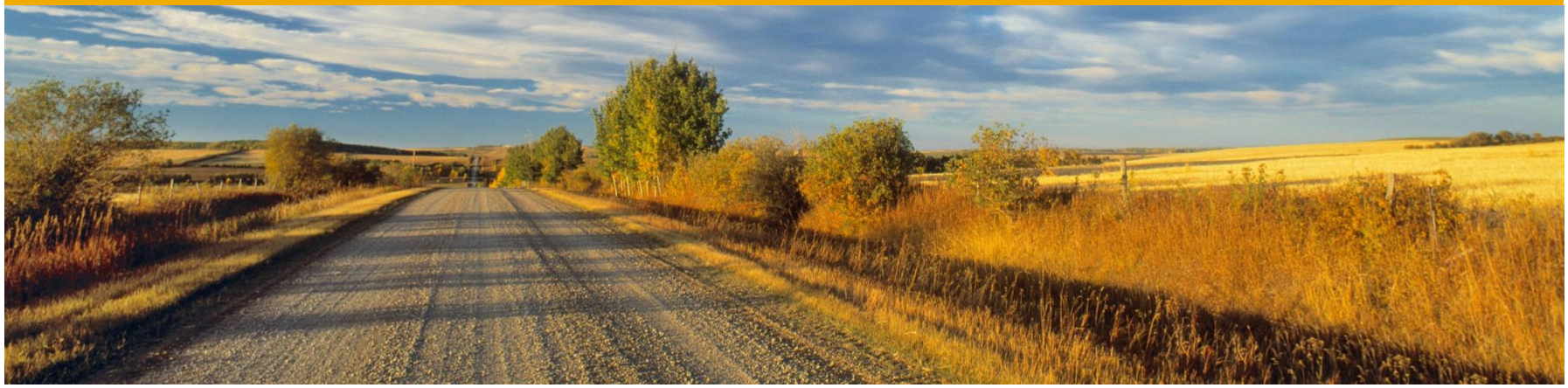
To create a SELECT_ALL query, create a query and name it SELECT_ALL (or SELECT_BY_ELEMENTS if the query parameters are the same as the attributes of the assigned node to which the query is assigned).

Creating a Custom Query



Define the implementing class and the data type:

- The query class must implement interface `/BOBF/IF_FRW_QUERY` and contains the query logic.
- The data type can be a structure with any kind of component and can be used by a generic UI to display a range-table-based input form. At runtime, as soon as the query is executed after the form is filled, the parameter `IT_SELECTION_PARAMETERS`, which contains these values, is passed. Each line of it represents a value range related to a component contained in this data type (but not every component of the data type must always have a corresponding line in `IT_SELECTION_PARAMETERS` – passing a value range is optional). The query implementation can use the selection parameters for dynamic selections.



Query Implementation

Query Implementation
Overview

RETRIEVE_DEFAULT_PARAM (optional)

```
methods RETRIEVE_DEFAULT_PARAM
 importing
  IS_CTX type /BOBF/S_FRW_CTX_QUERY
 changing
  CT_SELECTION_PARAMETERS type /BOBF/T_FRW_QUERY_SELPARAM
 raising
  /BOBF/CX_FRW .
```

QUERY

```
methods QUERY
 importing
  IS_CTX                 type /BOBF/S_FRW_CTX_QUERY
  IT_FILTER_KEY          type /BOBF/T_FRW_KEY optional
  IT_SELECTION_PARAMETERS type /BOBF/T_FRW_QUERY_SELPARAM optional
  IS_QUERY_OPTIONS       type /BOBF/S_FRW_QUERY_OPTIONS optional
  IO_QUERY               type ref to /BOBF/IF_FRW_QUERY
  IO_READ                type ref to /BOBF/IF_FRW_READ
  IO_MODIFY              type ref to /BOBF/IF_FRW_MODIFY optional
 exporting
  EO_MESSAGE             type ref to /BOBF/IF_FRW_MESSAGE
  ET_KEY                 type /BOBF/T_FRW_KEY
  ES_QUERY_INFO          type /BOBF/S_FRW_QUERY_INFO
  ET_DATA                type index table
 raising
  /BOBF/CX_FRW .
```

Queries are classes implementing the `/BOBF/IF_FRW_QUERY` interface.

Query Implementation
Method: RETRIEVE_DEFAULT_PARAMETERS

```
methods RETRIEVE_DEFAULT_PARAM
   importing
     IS_CTX type  /BOBF/S_FRW_CTX_QUERY
   changing
     CT_SELECTION_PARAMETERS type /BOBF/T_FRW_QUERY_SELPARAM
   raising
     /BOBF/CX_FRW .
```

Retrieves the default parameters of a query.

- **IS_CTX**: Context information of the query
- **CT_SELECTION_PARAMETERS**: Reference to the parameters of the query, which are filled with default values using this method

Query Implementation
Method: QUERY

```
methods QUERY
  importing
    IS_CTX                    type /BOBF/S_FRW_CTX_QUERY
    IT_FILTER_KEY             type /BOBF/T_FRW_KEY optional
    IT_SELECTION_PARAMETERS   type /BOBF/T_FRW_QUERY_SELPARAM optional
    IS_QUERY_OPTIONS          type /BOBF/S_FRW_QUERY_OPTIONS optional
    IO_QUERY                  type ref to /BOBF/IF_FRW_QUERY
    IO_READ                   type ref to /BOBF/IF_FRW_READ
    IO_MODIFY                 type ref to /BOBF/IF_FRW_MODIFY optional
  exporting
    EO_MESSAGE                type ref to /BOBF/IF_FRW_MESSAGE
    ET_KEY                    type /BOBF/T_FRW_KEY
    ES_QUERY_INFO             type /BOBF/S_FRW_QUERY_INFO
    ET_DATA                   type index table
  raising
    /BOBF/CX_FRW .
```

Executes the query logic.

Query Implementation
Method: QUERY

IS_CTX: Context information about the query (BO key, root node key, assigned node key,…)

IT_FILTER_KEY: If the query is to respect only a restricted set of the node instances, these instances can be specified by the consumer using this parameter. If the parameter is empty, all node instances of the query's assigned node are affected by the query.

IT_SELECTION_PARAMETER: This parameter represents a range table of attributes of the query parameter structure. If attributes are supplied, only these must be filled – the other attributes do not need to be filled if this improves performance.

IS_QUERY_OPTIONS:

- MAXIMUM_ROWS: Maximum number of node instances returned by the query. In the case of activated paging, the number of node instances of a single page.
- SORTING_OPTIONS: The sorting of the results can be modified using this parameter. It consists of a table allowing the sort order to be specified (ascending/ descending) for the columns (=attributes).
- PAGING_OPTIONS: Allows the paging options to be modified.
- PAGING_ACTIVE: Yes/no
- The top instance of the current page can either be defined by row (**START_ROW**) or by instance key (**START_KEY**).

Query Implementation
Method: QUERY

IO_QUERY: Reference to an object allowing a further query to be executed.

IO_READ: Reference to an object implementing the read interface to read instance data.

IO_MODIFY: Reference to an object implementing the modifying interface to modify instance data.

EO_MESSAGE: This message object contains all messages that are created while the query is executed.

ES_QUERY_INFO: This parameter contains a handle and the paging-related information.

- COUNT: Total number of results
- QUERY_HANDLE: A handle to identify the context

ET_DATA: Returning data table for generic result queries

ET_KEY: This parameter represents a set of the keys of the node instances that are the result of the query.

Questions & Answers

Questions

- Do `SELECT_BY_ELEMENTS` and `SELECT_ALL` queries have to be implemented?
- Can queries be assigned to nodes located in a dependent object?
- Is it possible to set properties for queries (e.g. enable/ disable)?
- Can I use queries within entity implementations (e.g. in an action)?
- If a new node instance is created during a transaction, will a queryexecuted later on in the same transaction be able to return it?
- Queries must not change instance data, so why do I need the `io_modify` importing parameter at all?
- Is it possible to reuse other queries in the implementation of a custom query?
- Should I use the `io_read` importing parameter or an SQL statement sent to the node's database table in the implementation of a custom query?
- Is it necessary to provide the paging and sorting feature for each query?

Questions & Answers

Do SELECT_BY_ELEMENTS and SELECT_ALL queries have to be implemented?
No, if the /BOBF/CL_DAC_TABLE is used, these queries are resolved automatically.

Can queries be assigned to nodes located in a dependent object?
No, for instance a SELECT_BY_ELEMENTS query would return all instances fulfilling the search criteria. If a DO is used in multiple business objects, this result is not related to a single DO use case and thus the result makes no sense.

Is it possible to set properties for queries (e.g. enable/ disable)?
No, queries are not node instance-related, thus node category-dependent properties and dynamic properties do not cover queries.

Can I use queries within entity implementations (e.g. in an action)?
No, queries are only intended to be used by consumers or other queries. Usually, you have node instance keys provided by BOPF (IT_KEY importing parameter) that can be used to instances related to retrieve/ retrieve_by_associations. In addition, you can use convert_altern_key to get further node instances.

Questions & Answers

If a new node instance is created during a transaction, will a queryexecuted later on in the same transaction be able to return it?
No, queries only operate on the database image, which means that the changes done so far in the current transaction are ignored. This is a difference to `convert_altern_key` and `retrieve`/ `retrieve_by_association`.

Queries must not change instance data, so why do I need the `io_modify` importing parameter at all?
If a custom query is assigned to a transient node, the query must write the result instances to the transient node. This ensures that the consumer is able to get them using, for instance, the `RETRIEVE` core service.

Is it possible to reuse other queries in the implementation of a custom query?
Use the importing parameter `IO_QUERY->QUERY(…)` to call a certain query located in the same BO.

Questions & Answers

Should I use the `io_read` importing parameter or an SQL statement sent to the node's database table in the implementation of a custom query?
Always use a SQL statement for performance reasons and to ensure that the query returns only instances of the database state.

Is it necessary to provide the paging and sorting feature for each query?
Yes, this is part of the query contract which must be fulfilled by each query – a consumer must be able to rely on that.

Thank you

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